

PATENT COOPERATION TREATY
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REC'D 26 JUL 2005

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

PCT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference FP19468	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/AU2004/000505	International filing date (day/month/year) 16 April 2004	Priority date (day/month/year) 17 April 2003	
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ G01B 11/02, G01N 9/00			
Applicant COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION et al			

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

a. ☒ (sent to the applicant and to the International Bureau) a total of 9 sheets, as follows:

☒ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

<input checked="" type="checkbox"/> Box No. I	Basis of the report
<input type="checkbox"/> Box No. II	Priority
<input type="checkbox"/> Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/> Box No. IV	Lack of unity of invention
<input checked="" type="checkbox"/> Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
<input type="checkbox"/> Box No. VI	Certain documents cited
<input type="checkbox"/> Box No. VII	Certain defects in the international application
<input type="checkbox"/> Box No. VIII	Certain observations on the international application

Date of submission of the demand 5 October 2004	Date of completion of the report 18 July 2005
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer LYNN BLOOMFIELD Telephone No. (02) 6283 2851

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/AU2004/000505

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1 (b))

☐ publication of the international application (under Rule 12.4)

☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

☐ the international application as originally filed/furnished

☒ the description:

pages 1 - 21 as originally filed/furnished

pages* received by this Authority on with the letter of

pages* received by this Authority on with the letter of

☒ the claims:

pages as originally filed/furnished

pages* as amended (together with any statement) under Article 19

pages* 22 - 30 received by this Authority on 5 July 2005 with the letter of 4 July 2005

pages* received by this Authority on with the letter of

☒ the drawings:

pages 1/7 - 7/7 as originally filed/furnished

pages* received by this Authority on with the letter of

pages* received by this Authority on with the letter of

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/figs

☐ the sequence listing (*specify*):

☐ any table(s) related to the sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/figs

☐ the sequence listing (*specify*):

☐ any table(s) related to the sequence listing (*specify*):

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/AU2004/000505

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1 – 50	YES
	Claims	NO
Inventive step (IS)	Claims 1 – 50	YES
	Claims	NO
Industrial applicability (IA)	Claims 1 – 50	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

The following documents identified in the International Search Report have been considered for the purposes of this report:

D1: US 2002/0117274

D2: FR 2512196

D3: US 6407819

Novelty (N), Inventive Step (IS)

Claims 1 – 50 meet the criteria for novelty and inventive step. D1, which is considered to be the closest prior art, discloses a method and apparatus for determining the fibre fineness of *individual* fibres. However, this document, either individually or in obvious combination with either D2 or D3, does not disclose or suggest a method or apparatus for measuring fibre fineness of a sample of fibres in which an image of at least some of the fibres is captured, the total length of the fibres in the image is measured using image analysis and the fineness of the entire sample is calculated based on the measured length.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for estimating the fibre fineness of a known mass of fibres, the method including the steps of:
 - 5 a) capturing with an image capturing device either
 - i) all of the fibres being tested in one or more images or
 - ii) a fraction of the fibres being tested in one or more images;
 - 10 b) determining the total length of the fibre or fibres in the or each image using automated computer image analysis; and
 - c) estimating the fibre fineness of the sample of fibres using the total fibre length in the image(s).
- 15 2. The method according to claim 1, wherein the fibres captured in the images are suspended in a fluid to form a suspension of known volume.
- 20 3. The method according to claim 2, wherein a known volume of the suspension is in the field of view of the image capturing device and thus captured in the or each image.
- 25 4. The method according to any one of claims 1 to 3, wherein step c) involves dividing the known mass of fibre by the total length of fibre.
- 30 5. The method according to any one of claims 2 to 4 whereby when step a) involves capturing a series of images that overlap, step b) involves taking into account the length of fibre in an overlapping section of the images to avoid over estimating the total length of fibre.
- 35 6. The method according to any one of claims 2 to 5, wherein the image capturing device is a digital camera or alike recording device.

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7. The method according to any one of claims 1 to 6, wherein the sample of fibres is dispersed on a viewing platform and relative movement between the viewing platform and the image capturing device enables a series of images to be captured.

8. The method according to any one of claims 2 to 7, wherein the method includes forming the suspension by mixing the fibres in a fluid.

9. The method according to any one of claims 2 to 8, wherein the method includes conveying the suspension past the image capturing device such that one or more images of the fibres in the suspension can be captured.

10. The method according to claim 9, wherein the suspension is contained in a closed loop that extends past the image capturing device so that the suspension can be recirculated through the closed loop while the image(s) are captured.

11. The method according to any one of claims 1 to 10, wherein the method also includes the step of weighing the sample of fibres selected for testing.

12. The method according to any one of claims 1 to 11, wherein the fibre fineness of the fibres is estimated when the standard error of the mean value of measured fibre length per image determined in step b) is equal to or less than a preselected value.

13. The method according to claim 12, wherein the standard error be continuously recalculated after the capture of each image or a group of images to provide a running value of the standard error which may then be continuously compared to the preselected value while the method is carried out.

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14. The method according to claim 13, whereby when the fibres being tested are of a known uniform length, step b) involves counting the number of fibres in the image(s) using the automated computer image analysis.

5

15. The method according to any one of claims 2 to 14, wherein an estimate of the fibre fineness is calculated using the formula:

$$F = \frac{mv}{VL}$$

10 wherein F represents the average fibre fineness of the fibres in the images;

m represents the total mass of the fibres selected for testing;

15 V represents the total volume of the fluid suspension;

v represents the volume of the suspension captured in each image; and

L represents the mean length of fibre in the images captured.

20

16. The method according to any one of claims 2 to 15, wherein the fibre concentration appearing in the image(s) ranges up to 10.0 millimetres of fibre per square millimetre of image (mm/mm^2).

25

17. The method according to claim 16, wherein the fibre concentration in the image(s) ranges up to 2.0 mm/mm^2 .

30 18. The method according to any one of claims 2 to 17 wherein the image capturing device includes a chamber through which the suspension is conveyed, the chamber having a transparent wall and the field of view of the image capturing device is directed at the transparent wall
35 for capturing images of the fibres in the chamber.

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19. The method according to claim 18, wherein the cross-sectional area of the chamber transverse to the direction of flow of the suspension through the chamber vary such that the concentration of fibres captured in the image(s) can be adjusted by moving the position of the field of view of the image capturing device along the chamber.
20. The method according to claim 19, wherein the image capturing device is automatically adjusted along the chamber depending on the fibre concentration appearing in the images.
21. The method according to any one of claims 2 to 20, wherein the fibre concentration in the image(s) is adjusted by changing the total volume of the fluid in which the fibres are suspended or the mass of fibres suspended in the fluid.
22. The method according to any one of claims 2 to 21, wherein when the fluid of the suspension is a liquid, the method further includes adding a wetting agent to the liquid to improve the degree by which the fibres are uniformly distributed in the suspension.
23. The method according to claim 22, wherein the wetting agent is a surfactant or an alcohol.
24. The method according to claim 22, wherein the surfactant is a commercial cleaning detergent.
25. The method according to claim 22, wherein the surfactant is a non-ionic surfactant.
26. The method according to any one of claims 1 to 25, whereby when the fibres being tested are cotton or other cellulosic fibres, the method also includes

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estimating the average maturity value using the estimated fibre fineness from step c) and a micronaire value for the sample of fibres.

- 5 27. The method according to claim 26, whereby the average maturity value is calculated by the following equation:

$$F * M = 3.86 * Mic^2 + 18.16 * Mic + 13$$

10

wherein F is fibre fineness estimated in step c), M is maturity and Mic is micronaire.

- 15 28. An apparatus for estimating the fibre fineness of a known mass of fibres, the apparatus including:

an image capturing device for capturing either i) all of the fibres selected for testing or ii) a fraction thereof, in one or more images;

20 a computer capable of automatically determining the total length of fibre or fibres in the or each image; and

a means for estimating the fibre fineness of the fibres using the total fibre length in the image(s).

- 25 29. The apparatus according to claim 28, wherein the computer is programmed to estimate the fibre fineness using the formula:

$$F = \frac{mv}{VL}$$

wherein F represents the average fibre fineness of the fibres in the images;

30 m represents the total mass of the fibres selected for testing;

V represents the total volume of the fluid suspension;

v represents the volume of the suspension captured by each image; and

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L represents the mean length of fibre in the images captured.

30. The apparatus according to claim 28 to 30,
5 wherein the image capturing device is directly linked to the computer for determining the fibre length in the image(s).

31. The apparatus according to any one of claims 28
10 to 30, wherein the apparatus includes a fluid passageway that extends through a field of view of the image capturing device such that when the fibres are suspended in a fluid, images of the fibres can be captured as the fluid is conveyed through the passageway.

32. The apparatus according to claim 31, wherein the
15 passageway is in the form of a closed loop for recirculating the fibres through the field of view of the image capturing device.

33. The apparatus according to claim 32, wherein the
20 apparatus includes a control means for controlling the total volume of the suspension in the fluid passageway.

34. The apparatus according to claim 36, wherein the
25 control means is provided by the fluid passageway being flow connected to a head vessel, whereby maintaining the fluid level in the head vessel ensures that the fluid passageway contains a constant known volume of the
30 suspension.

35. The apparatus according to claim 34, wherein the
35 fluid passageway includes a chamber that extends through the field of view of the image capturing device including a transparent wall so that the image capturing device can capture images of the fibres passing through the chamber, and the chamber is configured such that the volume of the

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suspension in the field of view of the image capturing device is known.

5 36. The apparatus according to claim 34, wherein the cross-section of the chamber in a direction transverse to the direction of flow through the chamber is graduated such that the volume of fluid in the field of view of the image capturing device varies along the chamber.

10 37. The apparatus according to claim 36, wherein the depth of the chamber in a direction transverse to the direction of flow through the chamber tapers continuously between the inlet and outlet of the chamber.

15 38. The apparatus according to claim 36 or 37, wherein the cross-sectional area of the chamber transverse to the direction of flow through the chamber can be varied by actual movement of one wall of the chamber relative to another wall.

20 39. The apparatus according to claim 36, wherein the position of the field of view of the image capturing device is moveable along the chamber so that the volume of suspension in the field of view can be varied.

25 40. The apparatus according to claim 39, wherein the apparatus includes a drive assembly for adjusting the position of the image capturing device relative to the chamber.

30 41. The apparatus according to claim 40, wherein a computer for operating the drive assembly is programmed so that it can determine the volume of suspension passing the field of view of the image capturing device.

35 42. The apparatus according to claim 40 or 41, wherein the computer for operating the drive assembly

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automatically operates the drive assembly and thereby adjusts the position of the image capturing device when the fibre concentration in the image fall outside a selected range.

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43. The apparatus according to claim 42, wherein the selected range is from 0 to 10 mm of the fibre per square mm of image.

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44. The apparatus according to claim 43, wherein the selected range is from 0 to 2mm of fibre per square mm of image.

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45. The apparatus according to any one of claims 28 to 43, wherein the image capturing device includes a recording device that can record images in a digital format.

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46. The apparatus according to any one of claims 40 to 45, wherein the image capturing device also includes an illuminating means to assist in the capture of images of the fibres.

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47. The apparatus according to claim 46, wherein the illuminating means includes a light source positioned on the opposite side of the chamber to the recording device such that light transmitted through the fibres can be detected by the recording device.

30

48. The apparatus according to claim 47, wherein the illuminating means includes a light source on the same side of the chamber as the recording device such that light reflected from the fibres can be detected by the recording device.

35

49. The apparatus according to any one of claims 46 to 48, wherein the illuminating means is moveable relative

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to the chamber such that when the image capturing means is moved relative to the chamber, the illuminating means is able to remain in a relatively fixed position compared to the image capturing device.

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50. The apparatus according to any one of claims 40 to 49, wherein the illuminating means is moveable by the drive assembly for moving the image capturing device.